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Ashley Sebelius

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POST TOTAL KNEE ARTHROPLASTY PROTOCOL ADAPTATIONS:

A CASE STUDY

by

ASHLEY SEBELIUS

A Scholarly Project Submitted to the Graduate Faculty of the

Department of Physical Therapy

School of Medicine

University of North Dakota

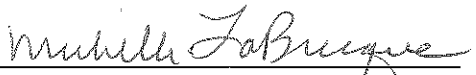
in partial fulfillment of the requirements for the degree of

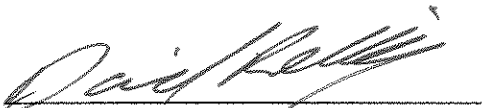
Doctor of Physical Therapy

Grand Forks, North Dakota

May, 2016

This Scholarly Project, submitted by Ashley Sebelius in partial fulfillment of the requirements for the Degree of Doctor of Physical Therapy from the University of North Dakota, has been read by the Advisor and Chairperson of Physical Therapy under whom the work has been done and is hereby approved.

  
(Graduate School Advisor)

  
(Chairperson, Physical Therapy)

## PERMISSION

Title: Post Total Knee Arthroplasty Protocol Adaptations: A Case Study

Department: Physical Therapy

Degree: Doctor of Physical Therapy

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## ACKNOWLEDGEMENTS

Special thanks to my professors and clinical instructors in giving me the skills and tools in becoming the best physical therapist I can be. A big thanks to my parents for their compassion, faith, and endless phone calls of encouragement.



## ABSTRACT

Background and Purpose: Osteoarthritis (OA) is the largest source of physical disability in the United States and the joint most commonly affected by OA is the knee.<sup>1</sup> Total knee arthroplasty (TKA) is frequently implemented as a treatment for knee OA. There is research that anxiety affects the patient's outcomes following total joint arthroplasty, but nothing to suggest how to specifically manage it.<sup>2,3</sup> The purpose of this scholarly report is to discuss the physical therapy (PT) of a patient post TKA and how modifications to PT intervention were needed due to other medical and emotional issues.

Case Description: Patient was a 56 year old female presenting to outpatient PT five days post left total knee arthroplasty. Left knee AROM on initial evaluation was lacking 10° of extension with 80° of flexion. Patient's other medical conditions included a severe "S" shaped scoliosis. Patient was overly emotional and reported that she had anxiety about falling behind in her rehabilitation.

Intervention: Frequency of outpatient PT was twice a week for eight weeks. A heavy focus of the patient's intervention was placed on regaining left quadriceps strength as quadriceps weakness is a primary impairment in individuals with TKA.<sup>1</sup> Another focus of intervention was hip abductor strengthening to help stabilize the pelvis during gait and stair ambulation.

Outcomes: Patient was seen for a total of 11 sessions over five weeks with increased left knee AROM and strength, and an improved patient-therapist relationship. Patient's anxiety and back pain secondary to scoliosis continued throughout PT sessions. Intervention adaptations, frequent verbal reassurance, and an increased amount of patient education were provided and goals were met by the time of her discharge from PT.

Discussion: Patient had overall positive outcomes post left TKA. More attention was placed on the positives of patient's rehabilitation to keep her anxiety reduced. Modifications of positioning were utilized to minimize back pain secondary to her scoliosis. Further research and protocols including adaptations for patients with increased anxiety and severe scoliosis are needed.

## CHAPTER I

### BACKGROUND AND PURPOSE

Osteoarthritis (OA) is the largest source of physical disability in the United States, and the joint most commonly affected by OA is the knee.<sup>1</sup> OA becomes more prevalent with aging, especially with the prominent group of Baby Boomers.<sup>4</sup> Total knee arthroplasty (TKA) is frequently implemented as a treatment for knee OA as it provides considerable relief of knee pain and shows improvements in self-assessment health questionnaires.

TKA procedures are projected to grow by 673% by 2030.<sup>5</sup> A literature review by Coudeyre et al.<sup>6</sup> discussed a significant impact on outcomes with supervised physical therapy pre- and post-operatively. As the number of knee surgeries increase, so will the amount of patients needing physical therapy services for post-operative rehabilitation. Bozic et al.<sup>5</sup> stated the average total cost of a total knee arthroplasty procedure in 2006 was \$49,360. More recently, *Insall & Scott Surgery of the Knee*<sup>7</sup> showed a 15 percent increase in reimbursement of total knee costs from 1993 to 2009. As technology increasingly advances, costs are increasing as well. With patients having a significantly larger bill, it is important to maintain the integrity of the procedure for the patient to fully secure the benefits of a joint replacement.

Along with having surgery, patients are often dealing with past and/or current stressors, including the possibility of additional health related issues. Patient care must extend past a

standardized TKA protocol. Each patient is unique so every physical therapy plan of care should address each patient individually. In a study completed by Ranawat et al<sup>8</sup>, an identical standardized TKA protocol was provided to each patient post TKA with a total of 139 knees. Under this protocol, physical therapy began on day one following the operation and included the following activities: protected ambulation, isometrics, and ROM exercises. This study concluded that 85 percent of the patients recovered regardless of the specific post-operative physical therapy interventions utilized.

Most TKA outcome studies cover a generalized population. It becomes more difficult to obtain studies with a larger number of participants who have unique or specific co-morbidities. For example, there are currently no studies researching the effects of severe scoliosis and an anxiety disorder in a patient's recovery post TKA. Relying on generalized studies for TKA protocols or plans of care could lead to an extended recovery when a patient has unique co-morbidities.

There is research that anxiety affects the patient's outcomes post TKA and THA, but nothing to suggest how to specifically manage it.<sup>2,3</sup> Hirschmann et al<sup>9</sup> investigated anxiety and depression on outcomes post TKA. This study found that both are significant predictors for poorer outcomes. Physical therapists deal with the physical aspect of patients, however emotional and psychological aspects are also important to consider when treating patients. Extending patient care beyond the physical diagnosis to incorporate the whole individual may improve a patient's physical outcomes, perceived outcomes, and a physical therapist's clinical judgement. Personalizing plans of care to ensure the full benefits of the TKA procedure and to provide more options for interventions beyond the common TKA protocol is needed.

The purpose of this scholarly report is to discuss the physical therapy of a patient post TKA and how modifications to PT intervention were needed due to other medical and emotional issues. Physical therapists' clinical judgements can modify future patient care based on co-existing psychosocial, medical, and physical aspects.

## CHAPTER II

### CASE DESCRIPTION

The patient was a 56 year old female presenting to outpatient physical therapy five days post-operative left TKA. She initially began having knee pain approximately 35 years ago, at which time she had an open left knee meniscectomy. Her left knee pain continued for another 10 years so the patient underwent an arthroscopic procedure of her left knee. During the procedure, her surgeon noted advanced osteoarthritis was already present. Patient stated she originally wanted to delay having a TKA but during the past year her pain had increased significantly. The knee pain began to affect her ability to complete tasks at work and home.

Patient's other medical conditions included a severe "S" shaped scoliosis with two 45 degree angles. Her scoliosis caused back pain after excessive amounts of time in standing and/or sitting. She reported that she was a healthy individual overall. She had trouble getting comfortable and sleeping at night. She lives with her husband in a one level home. Patient stated the only difficulty she was having at home was ascending/descending the three outdoor stairs and getting in and out of bed. She was unable to lift her own leg into bed and either her husband assisted her or she used her non-surgical lower extremity to lift her left leg. Patient was overall emotional and cried during the initial evaluation and subsequent treatment sessions. She reported that she had some anxiety about falling behind in her rehabilitation and had always been a very emotional person. Despite the patient's anxiety and emotions, she remained very motivated

during sessions and at home with her home exercise program (HEP). She was a vice president for a company and her job provided an adequate amount of time off to complete her rehabilitation. Her job required an extended amount of time in sitting, standing, and walking. She was motivated and determined to return to work. Currently she was working on a HEP provided by her inpatient physical therapist. She was able to describe her HEP in detail and performed exercises correctly showing compliance. Her HEP consisted of gluteal, hamstring, and quadricep isometric exercises, a seated knee flexion stretch, and a supine knee hang. Patient was instructed to continue with her HEP in addition to the new HEP program that would be given to her in outpatient PT.

Prior to surgery, the patient was able to complete activities around work and home independently but with an increased amount of pain. After her TKA, she was unable to drive herself to appointments, required a front wheeled walker for safe and efficient ambulation, and needed a moderate amount of assistance to lift her surgical extremity into bed. Patient was currently taking morphine and oxycodone for pain management. She followed the prescription instructions in both dosage and timing. Patient was instructed to take pain medications one hour prior to her therapy sessions in order to get the full benefit from therapy sessions. This would allow for better tolerance during range of motion (ROM), stretching, and strengthening exercises. Patient stated her goals were to improve her knee flexion, be able to lift her surgical extremity independently, and "stay on track" with her recovery.

#### Examination and Evaluation

She presented to physical therapy with a front wheeled walker and her left knee surgical incision was bandaged. Patient's surgical incision was free of infection, showing no signs of

excess redness, warmth, or inflammation. However moderate amount of swelling was noted. She ambulated with an increased stance on the right L/E and reduced left knee flexion/extension causing a reduced step height moderately on the left. The patient had an adequate speed and step length for safe community ambulation. She would fatigue easily during her exercises on the non-surgical extremity, showing a low level of overall physical fitness and endurance.

Patient completed Lower Extremity Functional Scale (LEFS) scoring a 20/80. LEFS is known for its test retest reliability.<sup>10</sup> Patient rated her left knee pain at the initial evaluation a 7/10. Grossly the patient had fully functional and within normal limits (WNL) ROM of bilateral upper extremities (U/E) and right lower extremity (L/E). Specific testing for ROM and strength was not performed but rather assessed through functional transfers (sit to stand, stand to sit, supine to sit, and front-wheeled walker ambulation). AROM was measured using a goniometer. Left knee AROM on initial evaluation was limited, lacking 10° of knee extension and she had 80° of knee flexion. Patient's strength grossly was fully functional and WNL in bilateral U/E and right L/E. Left knee strength was assessed with manual muscle testing (MMT). MMT was performed by the physical therapist using manual resistance to assess strength while patient was in a supine position. MMT was as follows: left knee flexion 3/5, left knee extension 3/5, left hip flexion 3/5, and left hip abduction 3/5. At initial evaluation, patient needed a moderate amount of assistance from the therapist to lift her surgical extremity when getting from sit to supine and supine to sit. Patient was moderately independent with sit to stand and standing to sitting as she used her upper extremities and walker for assistance.

Following completion of the initial examination and evaluation, the patient's current impairments included left L/E weakness, pain, moderate swelling, reduced ROM, and decreased

weight bearing status (weight bearing as tolerated) during ambulation and transfers. Her functional limitations included her inability to work, drive, ambulate and transfer independently. Examination and evaluation showed patient was a good candidate for therapy services.

### Diagnosis

Patient's diagnosis in *Physical Therapist's Guide to Physical Therapy Practice*<sup>11</sup> was 4H: Impaired joint mobility, muscle performance, and range of motion associated with joint arthroplasty. ICD-9 codes were knee pain (719.46), knee stiffness (719.56), leg weakness (729.89), antalgic gait (781.2), and other physical therapy (v57.1).

### Prognosis

Patient's prognosis was good due to her successful and uncomplicated surgery, compliance with inpatient HEP, and patient's motivation. Barriers to progression were patient's anxiety that increased when she was feeling behind the schedule of recovery and back pain from severe scoliosis.

Patient's goals were as follows:

Short term goals to be met by patient in 4 weeks:

- 1) Knowledgeable on outpatient HEP to continue progress outside of therapy sessions.
- 2) Full left knee extension in order to achieve functional gait with good step height and normal stance time on the left.
- 3) Pain will decrease from 7/10 to 0/10 in order to increase strength that will improve Lower Extremity Functional Score to 30/80.
- 4) 100° of active left knee flexion for greater ease with stair ambulation.



Long term goals to be met by patient in 8 weeks:

- 1) Patient will be independent with outpatient HEP to continue to improve overall strength.
- 2) Patient will have AROM of left knee will be 0-120° to improve overall function at home and work.
- 3) Patient's strength will increase in left L/E from 3/5 to 4+/5 to improve Lower Extremity Functional Score to 65/80.

#### PLAN OF CARE

Frequency of outpatient therapy was collaboratively decided between both the patient and physical therapist and was scheduled twice a week for eight weeks. Frequency was decided to be reduced to one time a week once patient reached ROM goals and was independent and comfortable with the new outpatient HEP. Patient was instructed to perform her HEP twice daily. Patient's plan of care included the following activities:

- 1) Manual therapy techniques to improve tissue extensibility allowing for greater ROM and ease of functional activities.
- 2) Therapeutic exercise to improve left L/E strength and ambulation.
- 3) Neuromuscular reeducation to improve quadricep/VMO and hamstring contraction allowing for further strengthening.
- 4) Creation, patient education, and patient independence with outpatient HEP.
- 5) Ambulation/gait training to increase left stance time and increase step height with no need for assistive devices.
- 6) Modalities as needed for pain control.

### CHAPTER III

### INTERVENTION

Patient received inpatient physical therapy by a different therapist two times per day at 45 minute sessions for three days. Patient was seen five days post discharge from the hospital where she returned home. Patient signed an informed consent form and verbally agreed to participate in physical therapy. During the course of therapy, the following were recorded at each session: circumferential measurements using a tape measure, AROM and PROM measurements using a goniometer, number of repetitions/sets of exercise completed, and pounds or resistance band color. Patient education was given throughout PT sessions to ensure positive outcomes. Patient was instructed to follow her HEP, icing/elevating regimen, and incision care in order to improve ROM, reduce swelling, and monitor and clean surgical incision site. Patient was given pictorial references and written instructions on exercises for her HEP. During the course of therapy, patient benefited from both verbal instruction and demonstration of therapeutic exercises. When required, manual cueing was added to assist in understanding. Specific procedural interventions are located in Table 1 below. A complete list of PT interventions can be found in Appendix A.

Table 1: Summarized Interventions

<b><i>Intervention</i></b>	SLR	Quad sets/SAQs	Step Downs
<b><i>ROM</i></b>	Bridges	Squats	Heel Slides and Digs
	Recumbent Bike	Wall slides	Supine Knee Hangs
<b><i>Pain Management</i></b>	Vasopneumatic cold compression		

A heavy focus of the patients PT interventions were placed on regaining left quadriceps strength. Quadriceps weakness is a primary impairment in individuals with TKA.<sup>1</sup> A study by Mizner et al<sup>1</sup> found that quadriceps strength was more strongly related to functional outcomes than knee flexion or bodily pain. Another focus of intervention was hip abductor strengthening. Strengthening the hip abductors was done to help stabilize the pelvis during gait and stair ambulation. This proximal stabilization facilitated distal stabilization at the knee joint.

Obtaining a functional squat with good body mechanics began early in intervention. This was used to help build hip and knee strength and to assist with gaining left knee flexion. Strengthening and increasing knee ROM was helpful in completing independent transfers. During transfers, patient would shift the majority of her weight to right L/E, compensating for pain and weakness on her left side. A mirror was placed in front of the patient to provide her with visual feedback and helped her keep equal weight bearing on bilateral L/E's. The patient was able to self correct and was encouraged to use the mirror at home during exercises.

Patient would become emotional at the beginning of each session. This was resolved with patient reassurance of being on track with goals, shifting topics to events the patient participated with in the past or would be participating in the future. An increased amount of patient education on healing time and effects of the overall surgical procedure was also done. Due to the time taken to decrease anxiety, time was taken away from performing interventions. The overall amount of time was able to be minimized by having conversations to reduce her anxiety during ROM exercises.

The patient's back pain secondary to her scoliosis would increase if intervention positions were not varied after 5-10 minutes. Instead of having the patient do all of her supine exercises at

one time, these exercises would be intermixed with exercises in sitting and standing. Positional changes kept the patient's attention focused on the activity and reduced her back pain.

## CHAPTER IV

### OUTCOMES

Patient was seen in outpatient PT for a total of 11 sessions over five weeks. With the patient's anxiety remaining throughout all PT sessions and back pain secondary to scoliosis, intervention adaptations, patient reassurance and increased amount of patient education were provided. Patient's knee pain was reduced to 0/10, which lowered her anxiety during the last three sessions. A meta-analysis of chronic pain with relation to anxiety disorders found that anxiousness is most effectively lowered by breaking the pain-cycle.<sup>2</sup> The patient was able to increase strength overall to 4/5 in left L/E and was able to achieve 0° of left knee extension and 120° of left knee flexion actively. A study found that a rehab goal of 110° of knee flexion would be sufficient for patients to function independently.<sup>12</sup> Another study reported that average knee flexion range of motion (ROM) after TKA ranged from 105° to 113°. This ROM should provide adequate mobility to perform the majority of tasks of daily living.<sup>1</sup> ROM gains can be seen in

Figure 1.

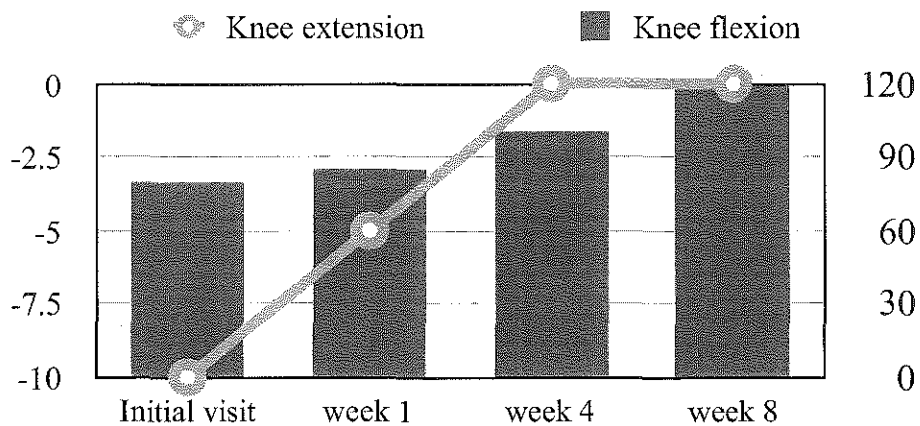


Figure 1: Weekly Left AROM

The patient consistently followed precautions and instructions to prevent infection and no other complications occurred. The patient was able to return to work one month before expected, drive independently, complete house work, and ambulate and transfer with no assistive device or assistance from husband or therapist at the time of discharge. The patient improved her Lower Extremity Functional Scale (LEFS) score from 39 to 52/80. To be clinically significant, the patient's score must improve by nine points and her score improved by 13.<sup>10</sup>

Lim et al<sup>13</sup> found that with TKA and other common procedures (ie. total hip arthroplasty) there is a significant degree of postoperative improvement translating to patient satisfaction and meeting their expectations of surgery. Patient stated she was satisfied with her left knee ROM and strength and how these changes progressed so quickly. Patient also stated she was not expecting to be able to return to her normal daily routine until three months post-operatively.

## CHAPTER V

### DISCUSSION

The patient had overall positive outcomes post TKA with an increase in left knee ROM and strength. Interventions and patient-therapist relationships were adapted to comply with patient's needs. More attention was placed on the positives of patient's rehabilitation to keep her anxiety reduced. Altering her position during PT intervention throughout helped keep her back pain (secondary to patient's severe scoliosis) to a minimum. The combination of above factors brought a certain amount of trust to the therapist-patient relationship. It is important to listen to the patient's needs and not take increased emotions or pain and pass them off as complaints.

Showing compassion with patients has been studied and shown to lower anxiety. Fogarty et al.<sup>14</sup> had 200 women randomly placed in groups. One group viewed videotapes of physicians showing enhanced compassion and the other group viewed physicians without showing compassion. The women all took a pre and post State-Trait Anxiety Inventory (STAI). The women who viewed the enhanced compassion video had significantly reduced anxiety scores. The women also completed a physician attribute rating scale. Those who saw the enhanced compassion videotape were more likely to believe that the doctor wanted what was best for the patient. This is shown with physical therapist-patient relationships as well. If a patient believes you are doing what is best for them and best for their recovery, compliance with PT intervention and patient participation improves.

Limitations of this report were not having all documentation available upon writing this case study. There is a limited amount of reported cases about TKA with co-morbidities of severe scoliosis and anxiety. More patients specific to this case study would help strengthen the theory of compassion and adaptation in patient care. Future research in TKA protocols and how to reduce increased anxiety post TKA would be important for PT practice.

### REFLECTIVE PRACTICE

In the future, more questions during the initial evaluation regarding past psychological examinations or medications taken could be done. There was nothing during the initial examination I would have changed. The changes that I would have made to my plan of care would be to ask my patient weekly what changes could be made to make her more comfortable. I could have suggested an on-site counselor for the patient to discuss what feelings are to be expected and help find stress and anxiety coping strategies. More areas of evidence that could have been sought would be how to adjust interventions for patients with severe scoliosis.

Overall I was happy with her outcomes and the length of time it took to achieve all of her goals. The patient and I were able to stay on track with recovery. The choices made to adapt and be open to talking through her stresses and fears I think helped overall. I think if I would have chosen not to address it, the patient would have become overwhelmed and untrusting of my judgment and likely would have delayed her progress in PT.



## APPENDIX A

## Appendix A: Interventions

Intervention	Instruction	Rationale	Parameters
Supine SLR	Supine, full knee extension, VMO contraction, lift L/E	Increase hip flexor/ quadricep strength to be (I) with lifting LE and increasing gait step height	10 x 2 increasing to 20 x 2 when she can finish previous 10 w/o fatigue.
Quad set > Short arc quads (SAQs) > Long arc quads (LAQs)	VMO focus, "lift heel off of table"	Strengthen quad to allow for full TKE for proper and efficient gait	10 x 2 increasing to 20 x 2 when she can finish previous 10 w/o fatigue progressing to SAQs then to LAQs
Supine heel slides	"Drag heel towards you" place towel under heel for more assistance if needed	Strengthen hamstrings through range and increase knee flexion	10 x 2 increasing to 20 x 2 when she can finish previous 10 w/o fatigue.
Supine hip abduction > Side-lying > Standing with resistance band	"Swing leg out towards me" May use manual assistance if needed	Strengthen glut/hip musculature to increase hip/knee stability for proper and efficient gait	10 x 2 when can complete w/o fatigue progress to side lying hip abduction then to standing resisted with theraband
Supine wall slides to assist knee flexion	Supine with towel under foot with foot on wall. Let gravity slide foot down towards the floor	To increase knee flexion to increase step height for efficient gait.	1 minute x 3 to ensure length of tissues remains elongated
Supine knee hangs with towel roll under ankle > add weight or manual stretch	Place towel roll under ankle to create space between posterior knee and table	To increase knee extension for TKE to assist with proper and efficient gait	1 minute x 3 to ensure length of tissues remains elongated. When tolerated add weight or manual stretch posteriorly.
Recumbent bike with half revolutions > full revolutions	Seated turning pedals to maximum tolerated. Completed both forward and backward	To increase knee flexion to increase step height for efficient gait.	5 minute warm up. Bike seat placed at number and moved down once patient can make full revolutions.
Seated heel digs with physioball > Theraband resisted hamstring curls	Seated on plinth with L/E placed over physioball. "dig heel into the ball". Avoid substituting with hip flexion	Increasing hamstring strength in pain free range to assist with AROM of the knee	10 x 2 when can complete w/o fatigue progress to theraband resistance in full range.

## Appendix A: Interventions

Intervention	Instruction	Rationale	Parameters
Supine glut bridge	Supine with feet placed equally. “push through your heels bringing your hips toward the ceiling.” Keeping knees from caving in or out	Increasing glut strength to assist in hip strength to increase hip/knee stability	10 x 2 increasing to 20 x 2 when she can finish previous 10 w/o fatigue.
Standing mini squats > squats > mini squats on 2” foam > squats on 2” foam	Feet shoulder width, weight through heels, knees behind toes, rear end back	Increasing LE strength to allow for independent sit to stand transfers	10 x 2 increasing to 20 x 2 when she can finish previous 10 w/o fatigue. Progressing in going into a deeper squat or adding an uneven surface.
Stationary marching in parallel bars > less U/E assistance utilized	“March in place” Watch for substitutions. Keep hips level.	Increase hip flexor strength to increase step height to assist with proper and efficient gait and stair ambulation	10 x 2 increasing to 20 x 2 when she can finish previous 10 w/o fatigue. Progress to less assistance as patient feels comfortable.
Vasopneumatic cold compression	Supine with knee elevated to patient’s comfort.	Pain and swelling control	10 minutes
2” step downs	Standing on step patient lowers right heel towards floor. Left knee kept behind toes and rear end back. Keeping knee from caving in or out.	Increase hip/knee musculature for hip/knee stability and to safely and efficiently descend stairs	10 x 2 increasing to 20 x 2 when she can finish previous 10 w/o fatigue then increasing step height.

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